The Evolution of Optimized and Sustainable Pro-Active Winter Operations (Paper ID: 0016)

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The Evolution of Optimized and Sustainable Pro-Active Winter Operations

- Best Practice and User Experience
  - Foundational Research
  - Integration of the Winter Maintenance & Meteorological Communities (Developed MDSS)
  - The concurrent equipment evolution
  - Comprehensive winter maintenance training
  - Mitigating environmental impacts
  - Cost savings (payback in investment)
  - Evolving pathways to sustainable operations/maintenance

Foundational Research

- SHRP Report H-350: Road Weather Information Systems, Research Report
- SHRP Report H-351: Road Weather Information Systems, Implementation Guide
- SHRP Report H-385: Development of Anti-Icing Technology
- SHRP Report H-683: Anti-Icing Study: Controlled Chemical Treatments

U.S. Department
of Transportation
**Federal Highway
Administration**

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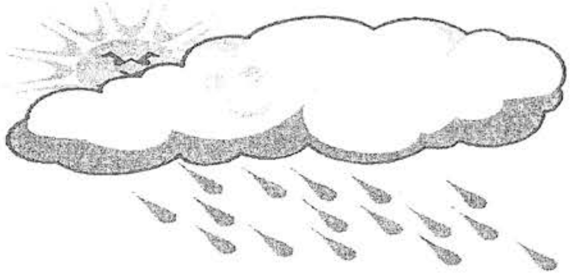

Manual of Practice for an Effective Anti-icing Program:

A Guide for Highway Winter Maintenance Personnel

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400 - 7th Street, SW
Washington, DC 20590

Office of Engineering R&D
Turner-Fairbank Highway Research
Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

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400 - 7th Street, SW
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Table 8. Weather event: light snow storm.

PAVEMENT TEMPERATURE RANGE, AND TREND	INITIAL OPERATION: pavement surface at time of initial operation	INITIAL OPERATION: maintenance action	INITIAL OPERATION: dry chemical spread rate, kg/lane-km (lb/lane-mi): liquid	INITIAL OPERATION: dry chemical spread rate, kg/lane-km (lb/lane-mi): solid or prewetted solid	SUBSEQUENT OPERATIONS: maintenance action	SUBSEQUENT OPERATIONS: dry chemical spread rate, kg/lane-km (lb/lane-mi): liquid	SUBSEQUENT OPERATIONS: dry chemical spread rate, kg/lane-km (lb/lane-mi): solid or prewetted solid	COMMENTS
Above 0°C (32°F), steady or rising	Dry, wet, slush, or light snow cover	None, see comments			None, see comments			1) Monitor pavement temperature closely for drops toward 0°C (32°F) and below 2) Treat icy patches if needed with chemical at 28 kg/lane-km (100 lb/lane-mi); plow if needed
Above 0°C (32°F), 0°C (32°F) or below is imminent; *ALSO* **-7 to 0°C (20 to 32°F),** remaining in range	Dry	Apply liquid or prewetted solid chemical	28 (100)	28 (100)	Plow as needed; reapply liquid or solid chemical when needed	28 (100)	28 (100)	1) Applications will need to be more frequent at lower temperatures and higher snowfall rates 2) It is not advisable to apply a liquid chemical at the indicated spread rate when the pavement temperature drops below -5°C (23°F) 3) Do not apply liquid chemical onto heavy snow accumulation or packed snow
	Wet, slush, or light snow cover	Apply liquid or solid chemical	28 (100)	28 (100)				
-10 to -7°C (15 to 20°F), remaining in range	Dry, wet, slush, or light snow cover	Apply prewetted solid chemical		55 (200)	Plow as needed; reapply prewetted solid chemical when needed		55 (200)	If sufficient moisture is present, solid chemical without prewetting can be applied
Below -10°C (15°F), steady or falling	Dry or light snow cover	Plow as needed			Plow as needed			1) It is not recommended that chemicals be applied in this temperature range 2) Abrasives can be applied to enhance traction

Notes

CHEMICAL APPLICATIONS. (1) Time initial and subsequent chemical applications to *prevent* deteriorating conditions or development of packed and bonded snow. (2) Apply chemical ahead of traffic rush periods occurring during storm.

PLOWING. If needed, *plow before chemical applications* so that excess snow, slush, or ice is removed and pavement is wet, slushy, or lightly snow covered when treated.

Annual Multidisciplinary Stakeholder Meetings

- Problems analyzed/solutions proposed
- State DOTs presented successful outcomes and implementation processes
- Major outcome—develop MDSS
- Major outcome—need better understanding of RWIS station data
- Major outcome—Clarus accurate weather observation data in a common format

Concurrent Activities

The Equipment Evolution

- International Winter Maintenance Technology Scanning Tour to Japan & Europe in March 1994
- Development of the Highway Maintenance Concept Vehicle (HMCV) (1995 to 2002)
  - Rockwell International assisted by **using their processes for developing new products and provided professional facilitators to conduct stakeholder meetings**
  - Iowa State University Center for Transportation Research & Education provided technical assistance
  - Five state DOTs formed pooled fund (IA, MI, MN, PA, and WI.

HMCV Features 2002 Final Report

- Automatic vehicle location (AVL)
- Automated activity reporting
- Air temperature measuring device
- On-board computer systems
- Pavement sensing devices
  - Pavement surface temperature
  - Salinity (freezing point detection system)*
- Multiple materials distribution systems
- Increased horsepower
- Increased vehicle conspicuity
- Friction measuring device*

(*pending)

More Concurrent Activities

Impact of Winter Operations Chemicals on the Receiving Environment

- Mountainous areas—damage to pine trees
- Surface runoff damaging lakes
- Contamination of shallow wells
- May 2007, NCHRP Report 577, *Guidelines for the Selection of Snow & Ice Control Materials to Mitigate Environmental Impacts*
  - Evaluated environmental and corrosion impacts of 42 frequently used winter maintenance chemicals
    - Decision tool
    - Purchase specification
    - Monitoring program

More Concurrent Activities

AASHTO's suite of winter maintenance methods & equipment training www.sicop.net (documents)

- Anti-icing/RWIS
- Selecting Snow & Ice Control Materials to Mitigate Environmental Impacts
- Equipment Maintenance
- Proper Plowing Techniques
- Deicing
- Blowing Snow Mitigation
- Winter Maintenance Management
- Performance Measures for Snow & Ice Control Opns

Savings and Payback

- Anti-icing and RWIS
  - Benefit/cost 2:1 to 13:1 on investment (1993)
  - Plus increase travel safety & level of service
  - Improved environmental quality
- MDSS
  - New Hampshire DOT Case Study (2009)
    - 17% savings to provide same level of service (MDSS vs without MDSS)
  - Indiana DOT (2009)
    - $10 million savings in salt and $1 million savings in overtime (normalized to varying winter conditions)

* Evolving Pathways to Sustainable Operations

- AASHTO Center for Environmental Excellence
  - One stop source of environmental information for transportation professionals
- FHWA Sustainable Highways
  - Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) pilot tested in 2011
- APWA Center for Sustainability
  - Framework for Sustainable Communities

Contact Information

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